



Product Specification

SPECIFICATION

FOR

APPROVAL

() Preliminary Specification

(●) Final Specification

Title	11.5" Product Specification
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Customer	Lenovo
Part Number	

SUPPLIER	EDO
MODEL	EB50QBC73.A
Version	V01

SIGNATURE	DATE
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Please return 1 copy for your confirmation with your signature and comments.

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Product Specification

CONTENT LIST

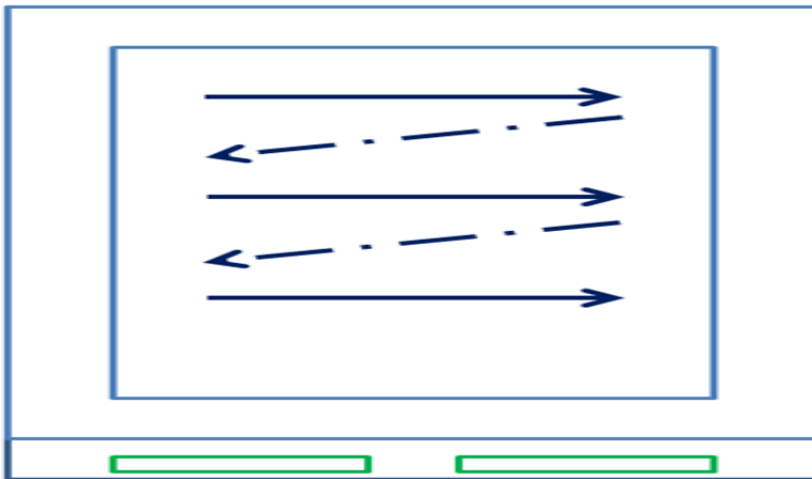
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1.1 GENERAL DESCRIPTION

This Specification defines AMOLED manufactured by EverDisplay Optonics(Shanghai) Limited, from here on refer as EDO. In the case of any unspecified item, it may require both EDO and the party designs this module into its product to work out a solution.

Block Diagram



Features

- Display color: 16.7M (RGB x 8bits)
- Display format: 11.5" (2560RGBx1600)
- Pixel arrangement: Real RGB
- Interface: MIPI
- Driver IC : RM69380
- Touch screen: On-cell; Touch IC: GT7385P
- Module type: Full module

Product Specification

1.2 General Spec

No	Item	Specification	Unit	Remark
1	Screen Size	11.5	Inch	
2	Active Area	247.68*154.80	mm	
3	Panel Size	251.58*159.94	mm	
4	Outline Dimension	261.88*169.00	mm	
5	Display Resolution	2560*1600	pixel	
6	Pixel Pitch	96.75	um	
7	Display Method	LTPS	-	
8	Display Mode	AMOLED	-	TN/VA/IPS
9	Display Color	16.7M	-	
10	Color Gamut	108	%	Typ.
11	Luminance	350	nit	Typ.
12	Contrast Ratio	60,000	-	Typ.
13	Viewing Angle	80	°	CR>10(U/D/L/R)
15	Weight	146	g	max
16	D-IC	RM69380	-	
19	Power Consumption	5450	mw	EL + Logic

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2.1 Absolute Maximum Ratings

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Table 2.1 Absolute Maximum Ratings

Parameter	Symbol	Values		Units
		Min	Max	
Analog /Boost Power Voltage	VCI	-0.3	5.5	V
I/O Voltage	VDDIO	-0.3	5.5	V
Operating Temperature	Top	-20	70	°C
Storage Temperature	Tstg	-40	80	°C

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3.1 ELECTRICAL CHARACTERISTICS

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
AMOLED Power positive	ELVDD	4.55	4.6	4.65	V	-
AMOLED power Negative	ELVSS	-3.45	-3.5	-3.55	V	Ref
Digital Power supply	VDDIO	1.65	1.8	1.98	V	Ref
Analog Power supply	VCI	2.6	2.8	3.6	V	Ref
Analog Power supply	AVDD	6.35	6.4	6.45	V	Ref
TP Power Supply voltage	TP_AVDD	2.7	2.8/3.0/3.3	3.4	V	

- Normal Mode
 Power Supply: VDDIO=1.8V VCI=3.3V
 Frame Frequency: Frame =60HZ @ 25degC, Brightness 350 nits, Command Mode,

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
100% Pixel On 350nits	IELVDD /ELVSS	-	580	770	mA	Ref
	IVCI	-	9	20	mA	Ref
	IVDDIO	-	190	200	mA	Ref
	IAVDD	-	55	70	mA	Ref

- HBM Mode
 Power Supply: VDDIO=1.8V VCI=3.3V
 Frame Frequency: Fframe =60HZ @ 25degC, Brightness 500 nits, Command Mode,

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
100% Pixel On 500 nits W(0.31,0.33)	IELVDD /ELVSS	-	780	860	mA	Ref
	IVCI	-	9	20	mA	Ref
	IVDDIO	-	190	200	mA	Ref
	IAVDD	-	55	70	mA	Ref

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3.2 TP IC Recommended Operating Conditions for whole set

Power Supply: TP_AVDD=3.3V , TP_VDDIO=TP_AVDD@ 25degC

Item(TP_AVDD)	Min.	Typ.	Max.	Unit
Finger Mode	-	74	90	mA
Finger Stylus Mode	-	74	90	mA
Gesture Mode	-	13	-	mA
Green Mode	-	15	25	mA
Sleep Mode	-	0.55	1.1	mA

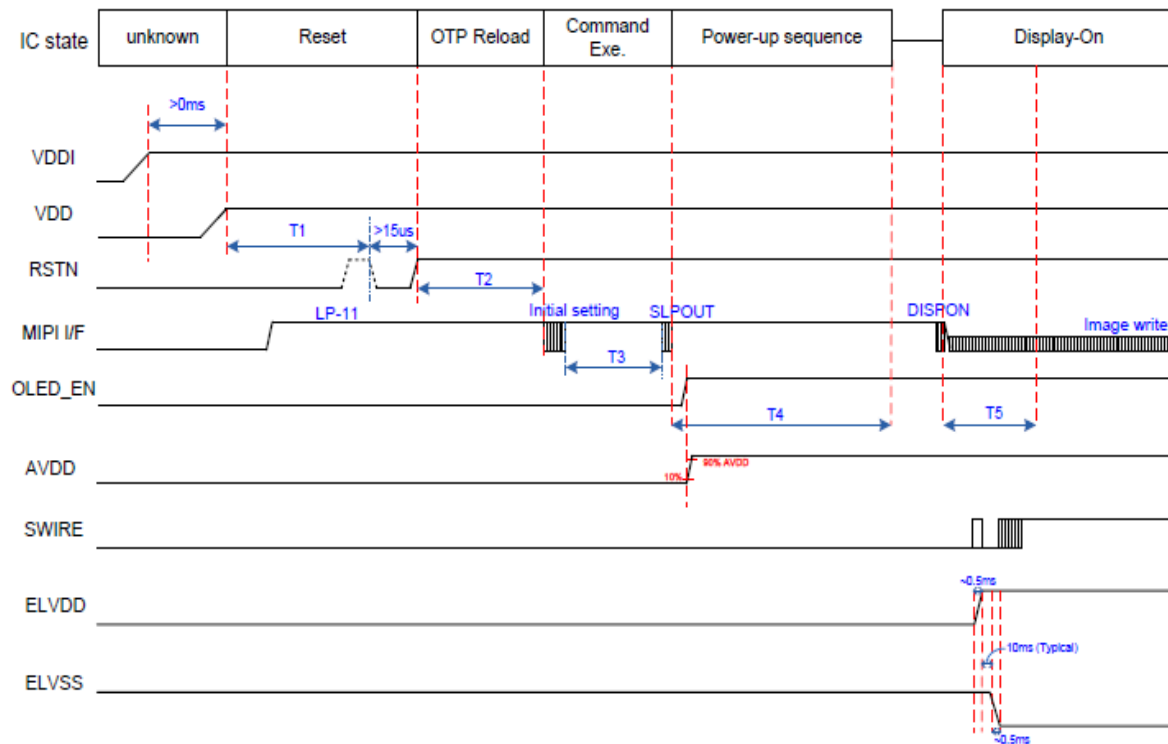
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3.3. INTERFACE CONNECTIONS

Num.	Name	I/O	Define
1	GND	Power	The power ground
2	MIPI_D3N_L	I/O	L-port MIPI DSI data3- for Master IC
3	MIPI_D3P_L	I/O	L-port MIPI DSI data3+ for Master IC
4	GND	Power	The power ground
5	MIPI_D2N_L	I/O	L-port MIPI DSI data2- for Master IC
6	MIPI_D2P_L	I/O	L-port MIPI DSI data2+ for Master IC
7	GND	Power	The power ground
8	MIPI_CLKN_L	I/O	L-port MIPI DSI Clock- for Master IC
9	MIPI_CLKP_L	I/O	L-port MIPI DSI Clock+ for Master IC
10	GND	Power	The power ground
11	MIPI_D1N_L	I/O	L-port MIPI DSI data1- for Master IC
12	MIPI_D1P_L	I/O	L-port MIPI DSI data1+ for Master IC
13	GND	Power	The power ground
14	MIPI_D0N_L	I/O	L-port MIPI DSI data0- for Master IC
15	MIPI_D0P_L	I/O	L-port MIPI DSI data0+ for Master IC
16	GND	Power	The power ground
17	TP_AVDD	P	Analog Power for TSP
18	TP_SCL	I	Serial interface Clock for TSP
19	TP_INT	I/O	State change interrupt for TSP
20	TP_SDA	I/O	Serial interface Data for TSP
21	Report_EN	I	Enable Coordinates to Report For AP
22	TP_RST	I	Active low, RESET the Touch IC
23	SWIRE_L	O	Enable ELVDD and ELVSS output of DC/DC IC
24	AVDD_EN_L	O	Enable VLIN (VSP) output of DC/DC IC
25	VDDI	P	Digital power for Driver IC
26	VDDI		
27	AVDD		
28	AVDD	P	Charge pumping Power for Driver IC
29	MTP_PWR_L	P	Power supply for OTP. Float it for normal operation.
30	RESX	I	Display RESET. Active low.
31	PCD_L	O	Panel Crack Detection
32	TE_L	O	Feed Back From Driver IC for synchronism
33	VCI	P	Analog power for Driver IC
34	Dummy	NC	No connection
35	ELVSS	P	AMOLED Negative power
36	ELVSS		
37	ELVSS		
38	ELVSS		
39	Dummy	NC	No connection
40	ELVDD	P	AMOLED Negative power
41	ELVDD		
42	ELVDD		
43	ELVDD		
44	Dummy	NC	No connection
45	GND	Power	The power ground
46	GND	Power	The power ground
47	MIPI_D3N_R	I/O	R-port MIPI DSI data3- for Slave IC
48	MIPI_D3P_R	I/O	R-port MIPI DSI data3+ for Slave IC
49	GND	Power	The power ground
50	MIPI_D2N_R	I/O	R-port MIPI DSI data2- for Slave IC
51	MIPI_D2P_R	I/O	R-port MIPI DSI data2+ for Slave IC
52	GND	Power	The power ground
53	MIPI_CLKN_R	I/O	R-port MIPI DSI Clock- for Slave IC
54	MIPI_CLKP_R	I/O	R-port MIPI DSI Clock+ for Slave IC
55	GND	Power	The power ground
56	MIPI_D1N_R	I/O	R-port MIPI DSI data1- for Slave IC
57	MIPI_D1P_R	I/O	R-port MIPI DSI data1+ for Slave IC
58	GND	Power	The power ground
59	MIPI_D0N_R	I/O	R-port MIPI DSI data0- for Slave IC
60	MIPI_D0P_R	I/O	R-port MIPI DSI data0+ for Slave IC
61	GND	Power	The power ground

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3.4 Power On Sequence

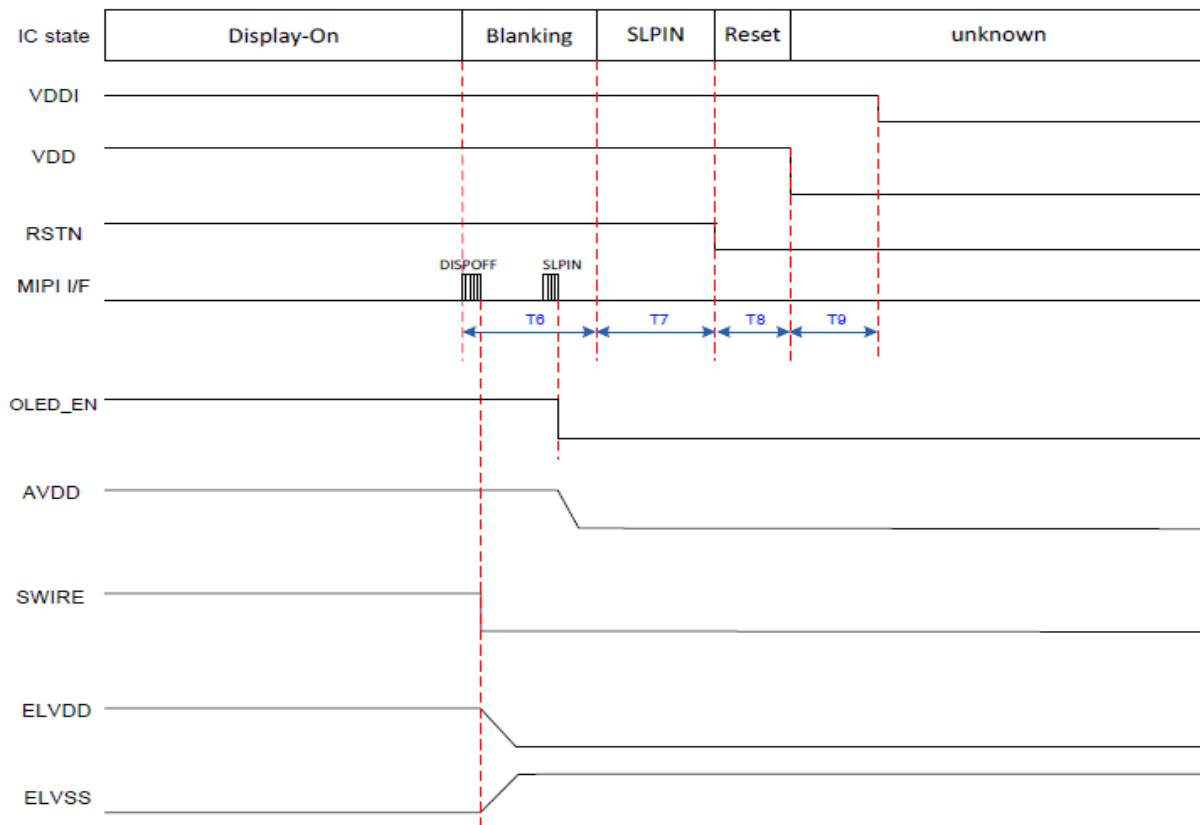


Symbol	Value			Unit	Remark
	Min.	Typ.	Max.		
T1	10	-	-	ms	Effective hardware reset period
T2	10	-	-	ms	OTP reload time
T3	0	-	-	ms	Initial code input finish to SLPOUT command input
T4	-	96	-	ms	Normal power-up sequence
T5	2	-	-	VS	Display-On Blanking region

Notes: VS means the time period of a complete display frame and are approximately 16ms if internal display timing is used.

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3.5 Power Off Sequence



Symbol	Value			Unit	Remark
	Min.	Typ.	Max.		
T6	2	-	-	VS	Display-Off blanking region
T7	1	-	-	VS	Blanking region
T8	1	-	-	ms	Effective hardware reset period
T9	2	-	-	ms	Power off period

Notes: VS means the time period of a complete display frame and are approximately 16ms if internal display timing is used.

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3.6 Timing requirements for RESETB

When RESETB of the reset pin equals to Low, it will be in the condition of reset.
When it is in the condition of reset, it will make the device recover the initial set.
However, in order to avoid the reset noise cause reset, there is a mechanism to judge about whether the reset is needed or not.
The closed interval of Low can be shown as the following.
(Test condition: VDDIO=1.65V~3.6V, VSS=0V, TA=-20℃~+70℃)

Parameter	Symbol	Conditions	Spec			Unit
			Min.	Typ.	Max.	
Reset low pulse width	Trst	-	20	-	-	μs

Table: Reset timing

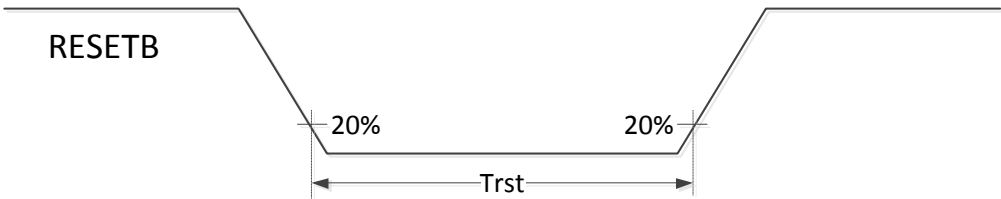


Figure: Reset timing

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4 OPTICAL CHARACTERISTICS

Item		Symbol	Conditions		Min.	Typ.	Max.	Unit	Remark
Brightness			Full White, Center		315	350	385	cd/m²	Note1
Brightness Uniformity			Full White		80	-	-	%	Note2
Contrast Ratio		CR	Normal to surface		60,000	-	-	-	Note3
CIE Chromaticity	White	x	Normal to surface		0.275	0.295	0.315	-	
		y			0.295	0.315	0.335	-	
	Red	x			0.656	0.686	0.716	-	
		y			0.281	0.311	0.341	-	
	Green	x			0.195	0.235	0.275	-	
		y			0.680	0.720	0.760	-	
	Blue	x			0.113	0.143	0.173	-	
		y			0.014	0.044	0.074	-	
Color Gamut(CIE 1931)			vs. NTSC		98	108	-	%	
CCT					7000	7800	8600	K	
Viewing angle			U/D/L/R CR≥10		80	-	-	°	
Color shift			@ 45 degree		-	-	4.5	JNC D	Note 4
Cross-talk			4% black or white window, 127 gray scale		-	-	2	%	Note 5
Gamma			9 Gray~ 15Gray		1.9	2.2	2.5		
			16 Gray~240 Gray		2.0	2.2	2.4		
Response time					-	-	2	ms	Note 6
Flicker			Normal Θ=Φ=0°		-	-	-40	dB	Note 7
Lifetime			T50		10000	-	-	h	
HBM			W(0.31,0.33)		450	500	550	nits	
Short-burn in					240h ≥ 93% 72h ≥ 93%				Note 8
Image retention			<1JND	128 Gray	-	-	15	sec	Note 9

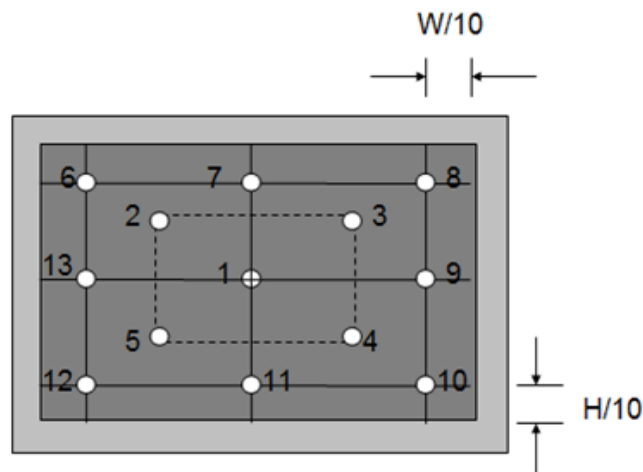
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[Note 1] Temp.25℃, (Angle、distance)

Environmental conditions : Temp.25℃±3℃, 65±20%RH, Dark Room.
Distance of OLED display center to measuring machine is 50cm.

[Note 2] Brightness Uniformity definition

Measure 13 points of Display Brightness,
Brightness Uniformity= $L_{\min}/L_{\max} \times 100\%$



[Note 3] Contrast Ratio

Dark Room C.R=LW/LB
LW: full white brightness of display center P0;
LB : full black brightness of display center P0.

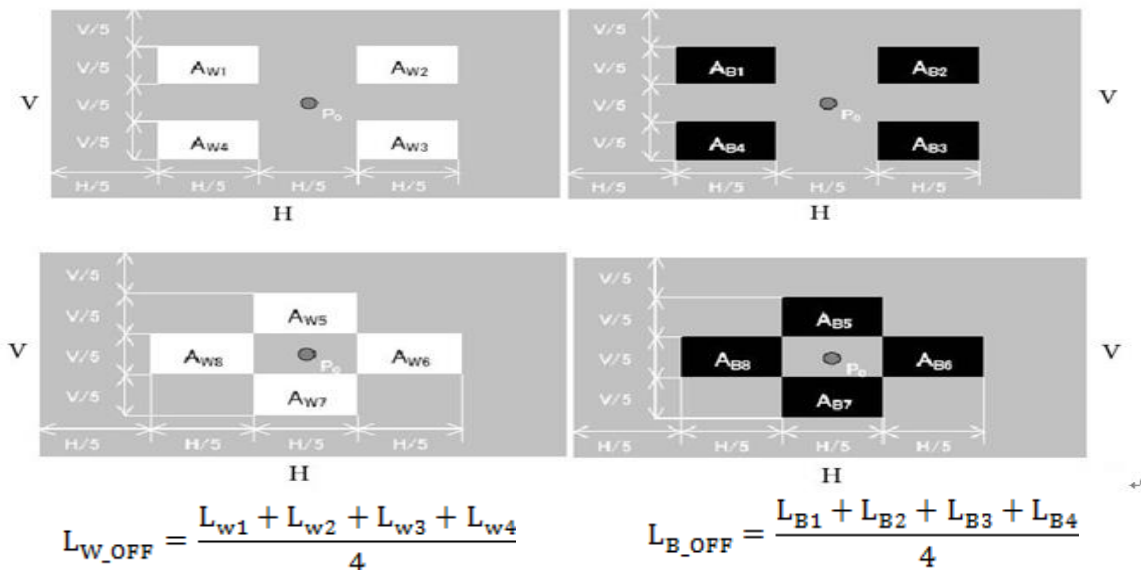
[Note 4] Color Shift

Out-spec panel(4.5~5.5JNCD) should be less than 5%

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[Note 5] Cross-talk

4% black or white window , 127 gray background.



$$CT = \frac{|L_{Wi_ON} - L_{W_OFF}|}{L_{W_OFF}} \times 100\% (i = 5 \text{ to } 8)$$

For white windows AWi (i = 5 to 8), and

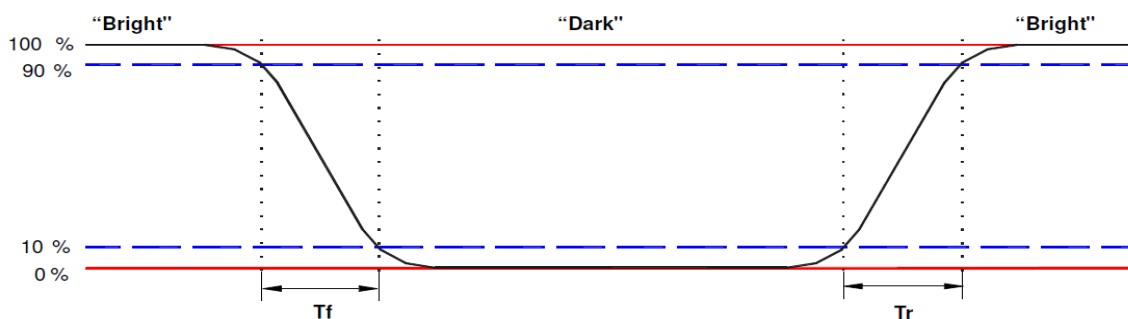
$$CT = \frac{|L_{Bi_ON} - L_{B_OFF}|}{L_{B_OFF}} \times 100\% (i = 5 \text{ to } 8)$$

For black windows ABi (i = 5 to 8). The maximum cross-talk value shall be noted in the measurement report.

[Note 6] Response Time

Response time=Pixel turn on and turn off time (White<=>Black).

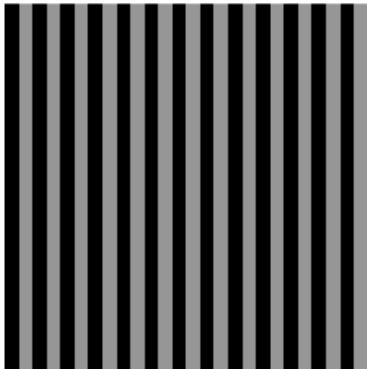
It is measuring transition time from 10% to 90% of luminance.



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[Note 7] Flicker

Suggested Instruments: Konica Minolta CA-310 or Klein Instruments K-8



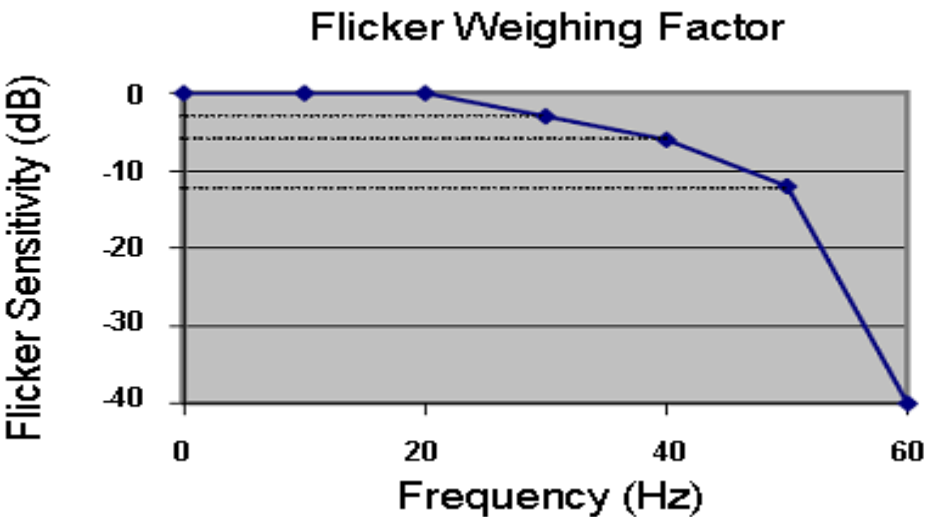
Odd row : L0 Black
Even row : L186 gray level

Flicker Test Pattern

The flicker level is defined by Fast Fourier Transformation (FTT) as follows:

$$Flicker = 20 \log_{10} \left(2 \frac{f_{FFTC}(n)}{f_{FFTC}(0)} \right) + FS(Hz) \quad (dB)$$

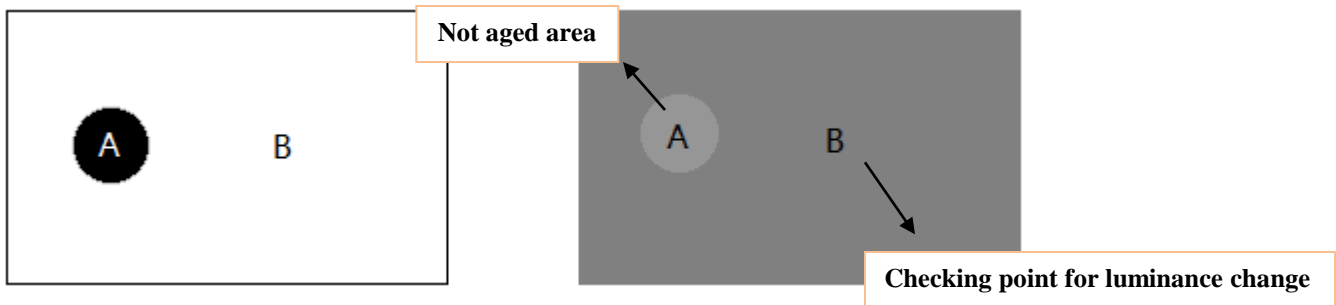
Where
fFFTC(n) is the n-th FFT coefficient.
fFFTC(0) is the 0-th FFT coefficient which is DC component.
FS(Hz) is the flicker sensitivity as a function of frequency.
The peak flicker level shall be reported based on the calculation using above formula in which FS(Hz) is determined by the flicker weighing factor shown below.



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[Note 8] Short-Burn in

To measure the burn-in effect, a test pattern with full white background (area B) and a black circle (area A) is applied to the AMOLED display at 350-nit setting with ACL off. The area of the black circle should not exceed the 20% of the whole displayed area and is big enough for brightness measurement.



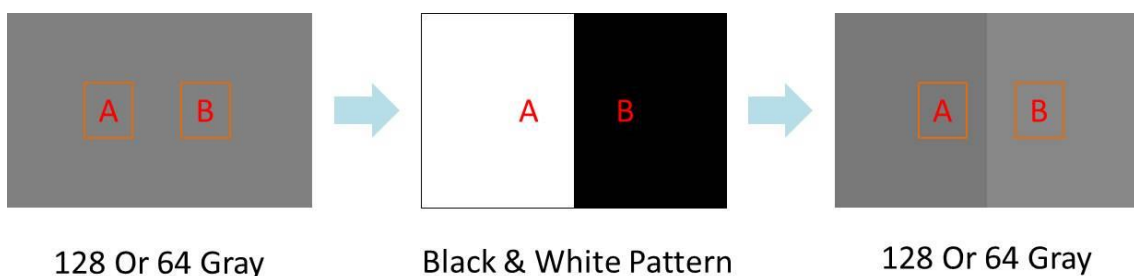
After the minimum time specied below (e.g. 200 hours), a full white image is applied on the display, and the luminance in area A and B are measured at 25°C and compared according to the change rate dened as:

$$1 - \{A_{200hrs}/A_{0hr} - B_{200hr}/B_{0hr}\}$$

5 display samples should to be measured (all of samples have better luminance than this value)

[Note 9] Image retention

Light on a 128 (64) gray pattern, capture the luminance of A and B (L_A / L_B), Change to a Black & White pattern, and light on this pattern for 30 minutes; Then change the pattern back to 128 (64) gray, at same time start to use CA310 (or similar optical device) measures the luminance of A and B (L'_A / L'_B), measure 60 times and each interval step is 1 sec;



Calculate the JND as below method: $JND = |(L'_B - L'_A) / (L'_B + L'_A) - (L_B - L_A) / (L_B + L_A)| / 0.004$, Record the time which satisfy the JND value less than 1;

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5. Touch Specification

No	Item	Conditions		Remark
1	TP Structure	On-cell		
2	Touch D-IC	Goodix		
3	Lamination Between CG And Display	OCA Full Lamination		
4	Gap Between CG / Display	0.200	mm	
5	Sensor Substrate	Glass		
6	Sensor Sheet Resistance	TBD		
7	Number of touch	37*60		
8	Sensing Method	Mutual + Self Capacitance		
9	ITO Pitch	4.200	mm	
10	Accuracy	center 1.0/Border 1.5	mm	φ6mm
11	Precision	center 1.0/Border 1.5	mm	φ6mm
12	Linearity	center 1.0/Border 1.5	mm	φ6mm
13	Jitter	<0.5	mm	φ6mm
14	Response Time	<30	ms	
15	Finger Separation	<12	mm	
16	Sensitivity	φ4	mm	
16	Report Rate	>100Hz@1Finger >80Hz@Muti-Finger		
17	Signal-to-Noise Raito	>30:1		
18	No Ghost input	Support		
19	Anti Water	Support		Note10
20	Temperature Shock Self-adaption	Support		Note11
21	Hover	Support		Note12
22	Palm Rejection	Support		Note13
23	Function Reset	Support		Note14
24	Gesture Support	Support		
25	Active Pen	Support at least MPP		

Product Specification**Note 10: Anti Water**

TP works well under below condition:

1. Water-drop(Size ϕ 1mm) on the top of TP. 2.Spray on the top of TP.

Note 11: Temperature Shock Self-adaption

-20C to 50/10min. Check TP performance at -10C/25C/50C. TP should work well.

Note 12: Hover

ϕ 7mm slug ,1mm distance to TP surface. No touch report .

Note 13: Palm Rejection

When 20cm palm on TP surface, no touch report and the reset area of TP still work well

Note 14: Function Reset

Execute Function Reset after power on and rouse the Pad.

Product Specification

6. MECHANICAL CHRACTERISTICS

Item	Specification	unit
Dimension outline	251.58*159.94	mm
Resolution	2560 RGB * 1600	dots
Active area	247.68*154.80	mm
Diagonal size	11.5	inch
Pixel pitch	32.25*96.75	μm
Panel thickness (Tape/LTPS/Encap/Pol/OCA/CG)	0.33/0.3/0.3/0.147/0.2/0.55	mm
Weight(Full Module)	146	g

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6.1 Outline Dimension Drawing

[illegible]

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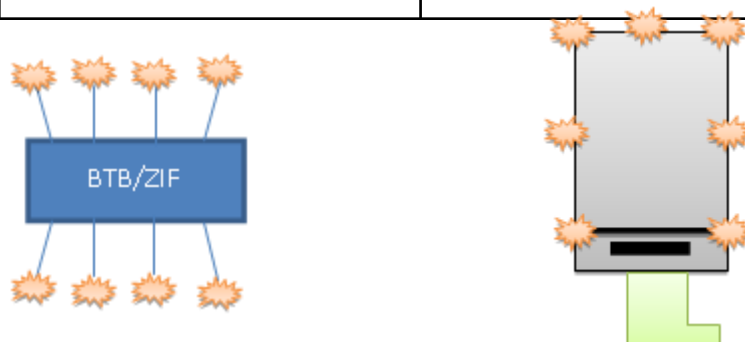
7. RELIABILITY TEST

7.1 Environmental Test

No	Item	Conditions	Quantity	Remark
1	High Temperature Operation	70±2℃/ 240 hours	5 pcs	After testing - No clearly visible defects or remarkable deterioration of display quality. However, any polarizer's deteriorations by the high temperature/ High humidity test are permitted. - No function-related abnormalities.
2	Low Temperature Operation	-20±2℃/ 240 hours	5 pcs	
3	High Temperature Storage	80±2℃/ 240 hrs	5 pcs	
4	Low Temperature Storage	-40±2℃/ 240 hours	5 pcs	
5	High Temperature Humidity Storage	60℃/90% RH 240 hrs	10 pcs	
6	High Temperature Humidity Operation	60℃/90% RH 240 hrs	10 pcs	
7	Thermal Shock	-40℃~85℃, 0.5hr, 100 cycles.	10 pcs	

7.2 Electrical Test

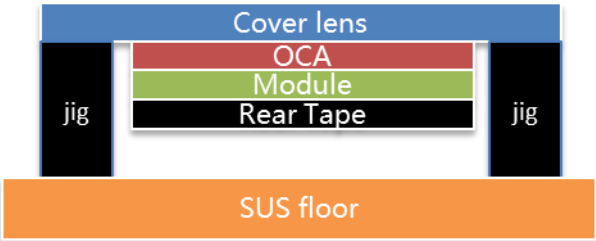
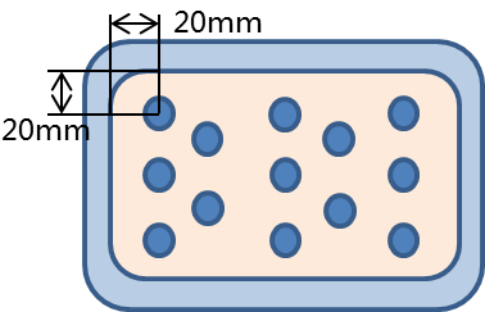
	Item	Main spec	Note
Non-operation	AMOLED Signal and power pin to elicit and GND lead to JIG GND (8 point, 5 times)	±2 kV , 150pF/330Ω (Module level; with CG)	After testing - Hard defect should not happen. - If it would be recovered to normal state after resetting, it would be judged as a good state. (Class C)
	Air Discharge (7 point, 5 times)	±4 kV, 150pF/330Ω (Module level; with CG)	
Operation	Air Discharge (7 point, 5 times)	±8 kV , 150pF/330Ω (Module level; with CG)	
	Contact Discharge (7 point, 5 times)	±4 kV, 150pF/330Ω (Module level; with CG)	



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7.3 Mechanical Test

No	Item	Conditions	Note
1	Drop Test	GB/T4857.18-19 Test Description For Packages (1 corner, 3 edges, 6 surfaces)	Package
2	Sinusoidal Vibration Test	Frequency range: 10~55Hz, Stroke:1.5mm, Sweep:10Hz~55Hz~10Hz 2hours for each direction of X.Y.Z.(6 hours for total, Package condition)	Package
3	Ball Drop Test	Weight:130g,Height:10cm,13 point,3pcs.The following figure shows test points and test mode(use EDO RA lab equipment)	



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8. Safety & Environment Test Reports

The control of hazardous substances meet RoHS/REACH/UL requirements.

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9. Package

